

NNI Program Overview: Interagency Coordination in Support of National Priorities

This report describes the multiagency National Nanotechnology Initiative (NNI), which was established in FY 2001. The 15 agencies participating in this program have diverse missions, but each expects to derive benefits that support its mission and to advance national priorities through an increased basic understanding of nanoscale phenomena and the development of novel technologies.

Organization and Management

The NNI is an interagency effort aimed at maximizing the return on the Federal Government's investment in nanoscale R&D through coordination of funding, research, and infrastructure development activities at individual agencies. Ten of the Federal agencies participating in the Initiative have funding dedicated to nanotechnology R&D. Other Federal organizations perform related studies and research, apply technologies based on the results from those

agencies performing nanoscale R&D, and participate in various NNI activities (See box below for lists of both sets of agencies).

In addition to sponsoring research, Federal support through the NNI provides crucial funds for the creation of university and government facilities with the specialized equipment and facilities required for nanoscale R&D. Federal support also helps educate the nanotechnology researchers of the future, as well as the workforce necessary for the growing use of nanotechnology in industry, primarily by providing funds for undergraduate, graduate, and postgraduate training in nanotechnology-related disciplines. The NNI plays a key role in fostering cross-disciplinary networks and partnerships, and in disseminating information to participating agencies and to the public, through workshops and meetings, as well as via the Internet (www.nano.gov). Finally, it encourages businesses, especially small businesses, to exploit the opportunities offered by nanotechnology.

Federal agencies with R&D budgets dedicated to nanotechnology research and development

Department of Agriculture
Department of Commerce (in particular, the National Institute of Standards and Technology)
Department of Defense
Department of Energy
Department of Health and Human Services (in particular, the National Institutes of Health)
Department of Homeland Security (in particular, the Transportation Security Administration)
Department of Justice
Environmental Protection Agency
National Aeronautics and Space Administration
National Science Foundation

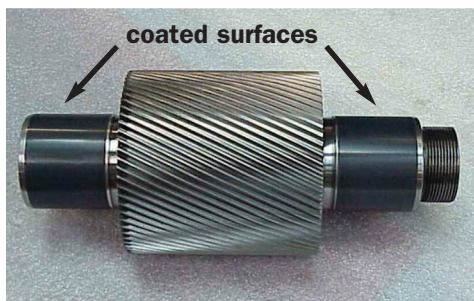
Other agencies participating in the NNI

Department of State
Department of Transportation
Department of Treasury
Food and Drug Administration
Intelligence Agencies



Nanotechnology on a Fast Track

The transition of nanotechnology research into manufactured products, while limited and preliminary, has already had significant impact. For example, a new form of carbon—the nanotube—was discovered in 1991. In 1995 it was recognized that carbon nanotubes were excellent sources of field-emitted electrons. By 2000, the “jumbotron lamp,” a nanotube-based light source that uses these field-emitted electrons to bombard a phosphor, was already available as a commercial product. By contrast, the period of time between the modeling of the semiconducting property of germanium in 1931 and the first commercial product (the transistor radio) was 23 years.



Another example of rapid insertion of nanotechnology into useful applications is in the field of wear-resistant coatings. In the mid-1990s nanoceramic coatings exhibiting much higher toughness than conventional coatings were first developed. Beginning in 1996, the DOD supported partnerships among the Navy, academia, and industry to develop processes suitable for use in manufacturing and to evaluate the coatings for use in the marine environment. In 2000, the first nanostructured coating was qualified for use on gears of air-conditioning units for U.S. Navy ships; an example of such a gear is shown at left. In 2001, the

technology was selected to receive an R&D100 Award. DOD estimates that use of the coatings on air valves will result in a \$20 million reduction in maintenance costs over 10 years. The development of wear-resistant coatings by the DOD is clearly allied with its mission, yet will lead to commercial applications that can extend the lifetime of moving parts in everything from personal cars to heavy industrial machinery. (Photo above courtesy Robert Rigney, A&A Co.)

The NNI is managed within the framework of the National Science and Technology Council (NSTC). The NSTC is the principal means by which the President coordinates science and technology programs across the Federal Government, providing policy leadership and budget guidance. The NSTC's Subcommittee on Nanoscale Science, Engineering, and Technology (NSET) coordinates the plans, budgets, programs, and reviews for the NNI. The Subcommittee is composed of representatives from each participating agency, the Office of Science and Technology Policy, and the Office of Management and Budget.

The National Nanotechnology Coordinating Office (NNCO) serves as the secretariat to the NSET Subcommittee, and supports the Subcommittee in the preparation of multi-agency planning, budget, and assessment activities. To adequately support the growing NNI activities, the position of NNCO Director was changed from part-time to full-time in April 2003. The

NNCO also serves as the point of contact on Federal nanotechnology activities for government organizations, academia, industry, professional societies, foreign organizations, and others. Finally, the NNCO develops and makes available printed and other communications materials concerning the NNI, and maintains the Initiative's website.

The Administration is focusing significant attention on the NNI. In order to further strengthen the Initiative, the President's Council of Advisors on Science and Technology (PCAST) has begun an external review of the NNI. The PCAST review will include a comprehensive assessment of the current NNI programs, and will lead to recommendations on how to improve the management of the program. PCAST's review of the Federal nanotechnology research program is an ongoing, long-term activity.



Funding Strategy

The NNI funding strategy is based on five modes of investment, each of which builds on previous and current nanotechnology programs.

The first investment mode supports a balanced investment in fundamental research across the entire breadth of science and engineering. Such fundamental research advances knowledge and understanding of novel physical, chemical, and biological properties of nanoscale materials and systems. This broad investment is critical because the outcome of basic research cannot always be anticipated, and discoveries in one discipline can have unexpected implications in another.

The second investment mode, collectively known as the “grand challenges,” focuses on nine specific R&D areas that are more directly related to applications of nanotechnology and that have been identified as having the potential to realize significant economic, governmental, and societal impact.

The nine grand challenge areas are:

1. Nanostructured Materials by Design
2. Manufacturing at the Nanoscale
3. Chemical-Biological-Radiological-Explosive Detection and Protection
4. Nanoscale Instrumentation and Metrology
5. Nano-Electronics, -Photonics, and -Magnetics
6. Healthcare, Therapeutics, and Diagnostics
7. Efficient Energy Conversion and Storage
8. Microcraft and Robotics
9. Nanoscale Processes for Environmental Improvement

Research directed toward the grand challenge areas aims to efficiently and effectively accelerate the transition of scientific discovery into innovative technologies that show a return on investment as quickly as possible.

The third mode of investment supports centers of excellence that conduct research within the host institution(s). These centers pursue projects with broad multidisciplinary research goals that are not supported by more traditionally structured

programs. These centers also promote education of future researchers and innovators, as well as training of a skilled technical workforce for the growing nanotechnology industry.

The fourth investment mode funds the development of infrastructure (e.g., the DOE user facility shown in Figure 2), instrumentation, standards, computational capabilities, and other research tools necessary for nanoscale R&D. The centers and infrastructure developed under the third and fourth modes facilitate the basic and applied research supported under the first two modes.

The fifth and final investment mode recognizes and funds research on the societal implications of nanotechnology, and addresses educational needs associated with the successful development of nanoscience and nanotechnology.

The FY 2004 Funding Request

As part of the FY 2004 Budget, President Bush requested \$849 million for nanotechnology R&D across all of the agencies that participate in the NNI. This represents an increase of approximately 10% over the amount appropriated by Congress for FY 2003. Roughly two-thirds of the funding proposed under the NNI will support university-based research. Table 1 presents the nanotechnology R&D budget for FY 2002 through FY 2004 by agency.

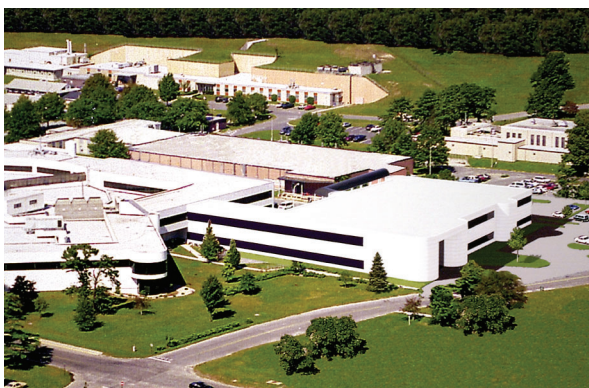


Figure 2. Conceptualization of the Center for Functional Nanomaterials, to be co-located with the National Synchrotron Light Source at the Department of Energy's Brookhaven National Laboratory.



Table 1. FY 2004 NNI Budget Overview by Agency
(Budget Authority, dollars in millions)

Agency	2002 Actual	2003 Request	2003 Appropriated*	2004 Request**	Change, 2003 to 2004†	% Change, 2003 to 2004†
NSF	204	221	221	249	28	13%
DOD	224	243	243	222	-21	-8%
DOE	89	133	133	197	64	48%
HHS (NIH)	59	65	65	70	5	8%
DOC (NIST)	77	69	66	62	-4	-6%
NASA	35	33	33	31	-2	-6%
USDA	0	1	1	10	9	900%
EPA	6	6	5	5	0	0%
DHS (TSA)‡	2	2	2	2	0	0%
DOJ	1	1	1	1	0	0%
TOTAL	697	774	770	849	79	10%

*“2003 Appropriated” refers to planned outlays with appropriated dollars; actual FY 2003 outlays may vary.

**The total NNI request for FY 2004, as originally published in the President’s FY 2004 Budget, was \$792 million (see <http://www.whitehouse.gov/omb/budget/fy2004/pdf/spec.pdf>, p. 185). By the February Budget release, some agencies had identified additional items within their FY 2004 R&D budget requests as falling under the purview of the NNI. These updated figures are reflected in this table (see also <http://www.ostp.gov/html/budget/2004/2004.html>).

† Change between 2003 Appropriated and 2004 Request.

‡ The NNI programs that are currently under DHS were under DOT prior to the formation of DHS in 2002.

Agency Abbreviations Used throughout this Report

DHS	Department of Homeland Security	IA	Intelligence Agencies
DOC	Department of Commerce	NASA	National Aeronautics and Space Administration
DOD	Department of Defense	NIH	National Institutes of Health
DOE	Department of Energy	NIST	National Institute of Standards and Technology
DOJ	Department of Justice	NSF	National Science Foundation
DOT	Department of Transportation	TSA	Transportation Security Administration
EPA	Environmental Protection Agency	USDA	Department of Agriculture
HHS	Health and Human Services		